SYNOPSIS

Gas Sensors Of Chemically Developed Nano Composites

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Tittle of the proposed research:-

"Gas Sensors Of Chemically Developed Nano Composites"

Abstract

This work reports the chemical synthesis of nano composite material or nano structured film and characterisation of prepare nano composite material by x-ray diffraction, scanning electron microscope, transmission electron microscope etc and application of nano composite material as gas sensors. Gas sensor devices are used to detect the hazardous, toxic and flammable gases such as CO, NO_X, SO_X etc. Gas sensor are also used to detect the depletion of oxygen gas. Sensitivity of a gas sensor of nano structured film to different gases at different concentration will be study. Optical and electrical properties of nano structured film will also study.

Introduction

The linguistic form nano originates from the classical latin nanus or its ancient greek etonym nanos meaning "dwarf".

Nanotechnology is a branch of Science, which deals with synthesis of materials with smaller dimensions ranging from 0.1 nm to 100 nm and their technical applications. In 1959, Physicist Richard Feynman first proposed the notion of nanotechnology by sharing his desire to build things on smaller dimensions. However, the term nanotechnology was first used by Norio Taniguchi in 1974, Professor of Tokyo University of Science, Japan, to explain the semiconductor processes on the scale of nanometer. In the beginnings of 21^{st} century, several commercial products as applications of nanotechnology were introduced, like in sunscreen, cosmetics, food products, silver nano-particles in food packaging, clothing, disinfectants, household appliances, stain-resistant textiles etc., [1]. Nanotechnology is also being used to treat and prevent health issues under the term Nano-medicine [2]. Nanotechnology application are developed to a variety of

industrial and purification processes, including the construction materials, military goods, and nano-machining of nano-wires, desalination of water, water filtration, wastewater treatment, groundwater treatment [3]. cleaning , gas sensors

Also, recently new fields developed from the root of Nanotechnology are Nano-biotechnology, Nano-electronics, Nano-energy, Nano-sensors, Nano-art etc. Nano-biotechnology is the biological application-oriented area of research in the hybrid discipline of science with an equivalent contribution. Nano-electronics is to the use of nanotechnology in electronics. Nano-electronics includes different devices and materials, with the smaller size as a common characteristic, such as semiconductor electronics, one-dimensional silicon nanowires or carbon nanotubes, MEMS, IDEs etc. [4]. Nanotechnology has shown potential to have a significant impact on the energy applications. An important part of nanotechnology related to energy application is nanofabrication i.e., the process of designing and fabrication of devices on the nanoscale. The nanofabrication has ability to fabricate devices smaller than 100 nanometers which helps the improvements in process to capture, store, and transfer energy. Perfections in the precision of nanofabrication technologies are crucial to solve several energy related complications which are the world is currently facing.

Ther are four types of intentionally produced nano materials .

1. Carbon based
2. Metal based
3. Dendrimers
4. Nano composites

NANO COMPOSITES: a nano composite is a composite material, in which one of the component has at least one dimension in nano scopic size that is around 10^{-9} metre. semiconducting/metal oxide/nano composite films have been widely used

for various applications such as solar cells , photo catalyst , anti reflection coating, lithium batteries , self cleaning , gas sensors etc

Gas sensor

Gas sensor devices are used to detect the hazardous and toxic gases present in the environment and those expelled by the chemical automobile fuel industries and combustion [5]. Gas sensor is also used to detect depletion in oxygen level.

An Overview of relevant literature

1. Methods of Chemical synthesis:

Solid-state reaction technique[6]., sol–gel, chemical vapor, thermal or electronic beam evaporation and pulsed laser deposition, chemical bath deposition methods such different methods used to synthesis due to excellent optical, electronic and chemical properties for various applications. They have promising gas-sensing properties and widely have been used for MOS gas sensors [7]. Gas sensitivity was investigated at room temperature using m-line spectroscopy technique on basis of

reversible variations of the refractive index of the samples under gas exposure. [8]

Sensing gases :

We study the various gas sensitivity with different concentration.

2. Objectives of topic with reasoning

The solid state metal oxide (thin film) gas sensors are low cost sensors and have high sensitivity to flammable and toxic gases. UV radiation detection, which is becoming important in domestic stragic sensor for application such as flame detection, water purification & pollution monitoring .To avoid the frequently occurred gas explosion of LPG & CNG.

Nano composite/MOS is widely used material in the research due to its wide band gap & its remarkable properties like piezoelectric & optical properties, MOS gives the transparent conductor, gas sensor are also used in acoustic-optics modulator various types of detectors like UV detectors & cosmetics.MOS also resistive type sensor it is photosensitive as well as used in various gas sensors like O_2, NH_3, H_2, C_4H_{10}, CO_2 & CO. also improve the gas sensitivity. Polyaniline is also used in gas sensing at room temperature.

Response of gas affected by operating temperature, gas concentration of test gas , surface area and sensor size and material morphology

Detection of the flammable & toxic gases by developing sensors and apply for the clinical & industrial purpose.

3. Need and significance

There is a need for simple, sensitive and stable electronic sensors suited for trace detection in a wide spectrum of applications ranging from lab-on-a-chip and in vivo biosensors to environmental monitoring and warfare agent detection, as opposed to the often employed expensive, bulky and complicated instrumental methods. Inexpensive and low-power devices are fueling the exponential growth of research in this area. Researchers are trying to fabricate nanomaterials that would work as better gas sensors with fast response, long-term stability, high sensitivity, and greater selectivity [6]. And

• Reversibility

• Fast response time and good recovery time

• Simple principle of operation

• Easy to handle

• Simple fabrication technique

• Temperature insensitive

4.The Methodology Comprising

I] Statement of hypothesis

II] Methods of data collection

III] Methods of data analysis

Synthesis of MOS from different chemical methods and charecterize by different technique like XRD, SEM, TEM, EDAX. raman uv etc study the morphological performance and mechanism .

Plan of Research /the chapter Scheme /Phase of Proposed Research work

Phase I:

First Year:

i] Briefly references used to get idea about procedure and analysis of the proposed work

ii] Preparation of single metal oxide Nanoparticle.

iii**]**Characterized by XRD, SEM, TEM, EDAX.

iv]Study the Sensitivity or Performance to different gases at different concentration.

Phase II:

Second year:

i] Preparation of metal oxide Nanoparticle by chemical synthesis

ii] By using hetero-junction structure of MOS with surface treatment of poly-aniline

iii] Prepare material characterized by different techniques XRD, SEM, TEM, EDAX

Optical and Electrical properties measurements for structural morphology, composition and bad gap.

iv] To evaluate performance against different gases at different concentration

v] Check the application for solar cell

Phase III:

Third year:

i] Different methods are employed to synthesis the different morphologies of metal oxides and further will be used to study the performance of gas sensor and compare the performance of solid state gas sensor

ii] All the characteristics will be done.

iii]Proposed research work will be submitted in the form of thesis comprising in different chapters

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